Appendix A

Clean Copy of All Claims as Amended

1. A method of modeling circulation in a living subject, such method comprising the steps of:

developing a pressure and flow model of an arterial circulatory system for living subjects in general;

correcting the model of the circulatory system to substantially conform to a specific arterial anatomy and physiology of the living subject;

calculating a flow of the circulatory system of the living subject based upon the corrected model; and

calculating a flow of the circulatory system based upon a selected blood flow perturbation.

2. The method of modeling as in claim 1 wherein the step of developing the model further comprises adopting the Circle of Willis.

3. The method of modeling as in claim 1 wherein the step of correcting the model further comprises selecting a vessel of the model.

4. The method of modeling as in claim 3 wherein the step of selecting a vessel of the model further comprises identifying a general area of a corresponding vessel in an image of the living subject.

5. The method of modeling as in claim 4 wherein the step of identifying the corresponding vessel further comprises localizing the corresponding vessel in 3-dimensional space.

6. The method of modeling as in claim 5 wherein the step of localizing the corresponding vessel further comprises measuring a diameter of the corresponding vessel.

7. The method of modeling as in claim 6 further comprising tracing the boundary into adjacent areas in three-dimensional space to locate respective ends of the corresponding vessel.

8. The method of modeling as in claim 7 further comprising updating the model based upon the measured diameter and locations of the respective ends of corresponding vessel.

9. The method of modeling as in claim 8 wherein the step of calculating the cerebral flow further comprises using a one-dimensional, explicit, finite difference algorithm based upon a conservation of mass equation.

10. The method of modeling as in claim 9 wherein the step of calculating the cerebral flow further comprises using a Navier-Stokes momentum equation.

11. The method of modeling as in claim 9 wherein the step of calculating the cerebral flow further comprises using an equation of state relating a local pressure to a local artery size.

12. Apparatus for modeling circulation within a living subject, such apparatus comprising:

a pressure and flow model of an arterial circulatory system for living subjects in general;

means for correcting the model of the circulatory system to substantially conform to a specific arterial anatomy and physiology of the living subject;

means for calculating a flow and pressure of the circulatory system of the living subject based upon the corrected model; and

means for calculating a flow and pressure of the circulatory system based upon a selected blood flow perturbation.

13. The apparatus for modeling as in claim 12 wherein the cerebral circulation model further comprises the Circle of Willis.

14. The apparatus for modeling as in claim 12 wherein the means for correcting the model further comprises means for selecting a vessel of the model.

15. The apparatus for modeling as in claim 14 wherein the means for selecting a vessel of the model further comprises means for identifying a general area of a corresponding vessel in an image of the living subject.

16. The apparatus for modeling as in claim 15 wherein the means for identifying the corresponding vessel further comprises means for localizing the corresponding vessel in 3-dimensional space.

17. The apparatus for modeling as in claim 16 wherein the means for localizing the corresponding vessel further comprises means for measuring a diameter of the corresponding vessel.

18. The apparatus for modeling as in claim 17 further comprising means for tracing the boundary into adjacent areas in three-dimensional space to locate respective ends of the corresponding vessel.

19. The apparatus for modeling as in claim 18 further comprising means for updating the model based upon the measured diameter and locations of the respective ends of corresponding vessel.

20. The apparatus for modeling as in claim 19 wherein the means for calculating the cerebral flow further comprises means using a one-dimensional, explicit, finite difference algorithm based upon a conservation of mass equation.

21. The apparatus for modeling as in claim 20 wherein the means for calculating the cerebral flow further comprises means using a Navier-Stokes momentum equation.

22. The apparatus for modeling as in claim 21 wherein the means for calculating the cerebral flow further comprises means using an equation of state relating a local pressure to a local artery size.

23. Apparatus for modeling circulation in a living subject, such apparatus comprising:

a pressure and flow model of an arterial circulatory system for living subjects in general;

a correction processor adapted to correct the model of the circulatory system to substantially conform to a specific arterial anatomy and physiology of the living subject; and

a flow processor adapted to calculate a flow and pressure of the circulatory system of the living subject based upon the corrected model and a flow and pressure of the circulatory system based upon a selected flow perturbation.

24. The apparatus for modeling as in claim 23 wherein the cerebral circulation model further comprises the Circle of Willis.

25. The apparatus for modeling as in claim 23 wherein the correction processor further comprises a cursor adapted to select a vessel of the model.

26. The apparatus for modeling as in claim 25 wherein the correction processor further comprises a pixel processor adapted to process pixel data of the general area of the corresponding vessel to locate a boundary area between the corresponding vessel and surrounding tissue.

27. The apparatus for modeling as in claim 26 wherein the pixel processor further comprises a distance processor adapted to measure a diameter of the corresponding vessel.

28. The apparatus for modeling as in claim 27 wherein the pixel processor further comprises a tracing processor adapted to trace the boundary into adjacent areas in three-dimensional space to locate respective ends of the corresponding vessel.

29. A method of modeling a surgical alteration of circulation in a living human subject, such method comprising the steps of:

developing a pressure and flow model of an arterial circulatory system for living subjects in general;

correcting the model of the circulatory system to substantially conform to a specific arterial anatomy and physiology of the living subject;

perturbing the corrected model of the circulatory system; and

determining a set of flow and pressure changes occurring within the circulatory system as a result of the perturbation.

30. The method of modeling as in claim 29 wherein the step of developing the model further comprises adopting the Circle of Willis.

31. The method of modeling as in claim 29 wherein the step of correcting the model further comprises selecting a vessel of the model.

32. The method of modeling as in claim 31 wherein the step of selecting a vessel of the model further comprises identifying a general area of a corresponding vessel in an image of the living subject.

33. The method of modeling as in claim 32 wherein the step of identifying the corresponding vessel further comprises localizing the corresponding vessel in 3-dimensional space.

34. The method of modeling as in claim 33 wherein the step of localizing the corresponding vessel further comprises measuring a diameter of the corresponding vessel.

35. The method of modeling as in claim 34 further comprising tracing the boundary into adjacent areas in three-dimensional space to locate respective ends of the corresponding vessel.

36. The method of modeling as in claim 35 further comprising updating the model based upon the measured diameter and locations of the respective ends of corresponding vessel.

37. The method of modeling as in claim 36 wherein the step of calculating the cerebral flow further comprises using a one-dimensional, explicit, finite difference algorithm based upon a conservation of mass equation.

38. The method of modeling as in claim 38 wherein the step of calculating the cerebral flow further comprises using a Navier-Stokes momentum equation.

39. The method of modeling as in claim 38 wherein the step of calculating the cerebral flow further comprises using an equation of state relating a local pressure to a local artery size.

40. Apparatus for modeling a surgical alteration of circulation in a living human subject, such apparatus comprising:

a pressure and flow model of an arterial circulatory system for living subjects in general;

means for correcting the model of the circulatory system to substantially conform to the physiology of the living subject;

means for perturbing the corrected model of the circulatory system; and

means for determining a set of flow and pressure changes occurring within the model of the circulatory system as a result of the perturbation.

41. The apparatus for modeling as in claim 40 wherein the means for correcting the model further comprises means for selecting a vessel of the model.

42. The apparatus for modeling as in claim 41 wherein the means for selecting a vessel of the model further comprises means for identifying a general area of a corresponding vessel in an image of the living subject.

43. The apparatus for modeling as in claim 42 wherein the means for identifying the corresponding vessel further comprises means for localizing the corresponding vessel in 3-dimensional space.

44. The apparatus for modeling as in claim 43 wherein the means for localizing the corresponding vessel further comprises means for measuring a diameter of the corresponding vessel.

45. The apparatus for modeling as in claim 44 further comprising means for tracing the boundary into adjacent areas in three-dimensional space to locate respective ends of the corresponding vessel.

46. The apparatus for modeling as in claim 45 further comprising means for updating the model based upon the measured diameter and locations of the respective ends of corresponding vessel.

47. The apparatus for modeling as in claim 46 wherein the means for calculating the cerebral flow further comprises means using a one-dimensional, explicit, finite difference algorithm based upon a conservation of mass equation.

48. The apparatus for modeling as in claim 47 wherein the means for calculating the cerebral flow further comprises means using a Navier-Stokes momentum equation.

49. The apparatus for modeling as in claim 48 wherein the means for calculating the cerebral flow further comprises means using an equation of state relating a local pressure to a local artery size.

50. A method of modeling a surgical alteration of circulation in a predetermined arterial circulatory system of a living human subject, such method comprising the steps of:

developing a pressure and flow model of the arterial circulatory system for living subjects in general;

correcting the model to substantially conform a specific arterial anatomy and physiology of the living subject;

perturbing the corrected model; and

determining a set of flow and pressure changes occurring within the corrected model as a result of the perturbation.